UNDERSTANDING GEOSPACE ON A GRAND SCALE: THE GLOBAL IONOSPHERE/THERMOSPHERE CONSTELLATION

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We present the concept of a constellation of polar orbiting satellites equally spaced in longitude (local time) to systematically sample both the neutral and ionzed gas components of the Earth in circular orbits near 350 km, including their density, temperature, and velocities. The instrumentation would include techniques to measure the height of the ionospheric "F-peak" and its variations along the orbit. The number of satellites (12? 24? 48?) and their configuration would be determined from modeling analysis and expected geophysical phenomena, including their drivers and characteristic time scales. Together with imaging data from separate satellites, the array of satellites with in situ probes would be expected to provide a new picture of (1) high latitude electrodynamics and atmospheric processes and associated coupling with magnetospheric mass and momentum input, (2) the response of the global ionosphere and thermosphere to magnetic storms, and (3) global neutral wind circulation patterns, neutral density structure, tides, planetary waves, and gravity waves. The comprehensive measurements gathered by the IT-Constellation envisioned here would provide a major leap forward in each of these areas, addressing global physical processes and providing fundamental, new knowledge of Geospace. In particular, by its very nature, the constellation addresses "system science", revealing how the ionosphere-thermosphere connects globally to the magnetosphere above and the troposphere below. We present this concept as the next logical step in observing the "whole" space environment using in situ probes in conjunction with imagers. We invite modelers to not only comment on this concept but also to become actively engaged in helping to define it.